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Minimum NSS to Select Rotary Wing

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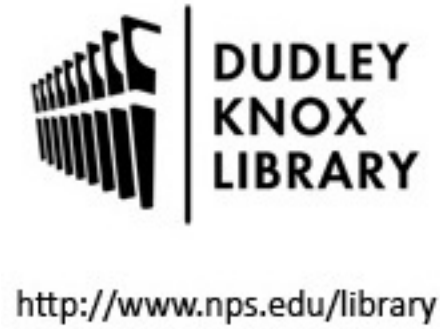

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

EMBA PROJECT REPORT

Minimum NSS to Select Rotary Wing

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12 March 2008

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Executive Summary

The Navy and Marine Corps Rotary-wing community is experiencing unprecedented expansion while becoming more technically complex than ever before. As a result, the quality of pilots required by each Rotary-wing community has increased as well. Currently, the only pipelines that require a minimum Navy Standard Score (NSS) for selection are: USMC Jet (52); Navy Tailhook (50); and USMC Tilt-rotor (40). The remaining pipelines, E6 (Navy only), Multi-engine, and Rotary-wing do not require a minimum NSS for selection. Traditionally, students who were not selected for a community with an NSS cutoff were selected into E6, Multi-engine, or Rotary-wing, with Rotary-wing receiving the lowest performers. This method of selection, while far from scientific, was accepted due to the fact that a Naval Flight Student (NFS) had to achieve a minimum NSS of 35 to advance from Primary Flight training.

With the implementation of Multi-Pilot-Training-Syllabus (MPTS) in both Primary (2000), and Advanced Flight Training (2004), the minimum NSS requirement to advance from Primary Flight Training was removed. To ensure the lowest attrition rate possible without sacrificing the quality of students selected for rotary-wing, the consultants on this study sought to determine whether there should be a minimum NSS to select a NFS for the rotary-wing pipeline.

This study analyzed data for a three-year period for students who selected Rotary-wing. Data for NFSs who were attrited for deficient performance was analyzed to determine their median and average NSS. The median and

average NSS of a Helicopter Advanced training flight attrite was 35 with a standard deviation of 6.17. If a minimum NSS of 35 is applied it would have reduced the flight attrites by 21 students, or 55 percent, and overall attrition by 31 percent. This would have also resulted in a loss of 148 NFS over three years. Although applying a minimum NSS one standard deviation above the median would have reduced the number of flight attrites by 89 percent, it would also have adverse effects on student production by eliminating 432 students over the three-year period.

Conclusions

- This study serves as the starting point to transform a historically anecdotal argument on the validity of NSS correlation to NFS performance into an empirical and analytical discussion.
- The statistical data supports establishing a minimum NSS of 35 to select Rotary-wing.

Recommendations

- Conduct additional research to determine the validity of establishing a minimum NSS for selecting Rotary-wing and determine the placement of lower performing NFSs.
- Fleet Replacement Squadrons establish a database to record individual student performance in order to historically compare students.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY 3

I. INTRODUCTION AND BACKGROUND 8

A. INTRODUCTION 8

B. BACKGROUND 8

II. PROJECT OBJECTIVES 10

III. PROJECT SCOPE 11

A. PERIOD OF STUDY 11

IV. METHODOLOGY 12

A. DATA COLLECTION 12

B. DATA ANALYSIS 12

V. RESULTS 14

A. PRIMARY TO NSS CORRELATION 14

B. ATTRITE DATA 15

1. Manpower Ramifications 17

VI. RECOMMENDATIONS AND CONCLUSION 19

A. CONCLUSION 19

B. RECOMMENDATIONS 19

LIST OF REFERENCES 22

INITIAL DISTRIBUTION LIST 24

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I. INTRODUCTION AND BACKGROUND

A. INTRODUCTION

NSS (Navy Standard Score) has been used for decades to determine the ranking of Naval Flight Students (NFS) in order to place them in different aviation communities. NSS is calculated based on student performance and is normalized to account for potential abnormalities in the distribution of a NFS's phase aggregate score (PAS). As changes in flight training have taken place over the years, the one constant is the use of NSS to rank individuals against their peers for pipeline selection at the end of primary flight training, and community selection at the end of helicopter advanced flight training. The use of NSS however, has greatly changed in that there is no longer a required minimum NSS to advance from one phase of training to the next, or complete the training syllabus; it is simply used as a ranking tool.

While minimum NSSs still exist for selection into certain pipelines at the end of Primary Flight Training, a minimum NSS for selection into the rotary-wing community does not exist, nor has one ever existed. This study seeks to examine if there should be a minimum NSS to select rotary-wing under the current MPTS syllabus.

B. BACKGROUND

At a recent Fleet Replacement Squadron (FRS) conference, the question was asked by the Aviation Training Branch of Headquarters Marine Corps whether or not there

should be a minimum NSS to select certain helicopter communities in the Marine Corps. The minimum NSS for selection to Marine jet pipeline from primary training is 52 and for selection into Marine tilt-rotor pipeline is 40, everyone lower and those who do not select the first choices are selected into the helicopter pipeline. In order to be selected for Tailhook (jets), Navy NFSs must have a NSS of 50 or greater, all other students are then selected into the E6, Multi-engine or Rotary-wing pipelines.

With the switch to MPTS (Multi-Pilot Training Syllabus), NSS no longer determines whether or not a student advances from Primary Flight Training to a follow-on phase of flight training. Instead, NSS is used solely for ranking the students in a class against each other for selection purposes. Selection for individual training pipelines is based on three factors: 1. Needs of the Navy and Marine Corps; 2. NFS Performance (NSS); and 3. NFS preference. At this time, no minimum criteria exist for selection into the rotary-wing community.

Initially, this study was designed to examine the correlation in each phase of flight training and determine whether or not there should be a minimum NSS to select into the most technically advanced rotary-wing communities in the Navy and Marine Corps. Due to insufficient data, the focus of this study was changed to examine the correlation between performance in Primary and Helicopter Advanced Flight Training in order to determine whether or not there should be a minimum NSS to select into the rotary-wing pipeline, and what the manpower ramifications of establishing a minimum NSS would be.

II. PROJECT OBJECTIVES

The revised objectives of this project are:

1. Determine if there is a correlation between Primary Flight Training NSS and Helicopter Advanced Flight Training NSS.

2. Determine if there should be a minimum NSS to select Rotary-wing out of Primary Flight Training and state the manpower ramifications of the minimum NSS.

These objectives directly respond to the recommendation made by the Aviation Training Branch, Headquarters Marine Corps that requested a reevaluation of the community selection process currently in use.

The first objective allows the client to see if strong performance in one phase of flight training translates into strong performance in the follow on phase of flight training.

The second objective is the most subjective objective of the project as the question posed has been debated since the implementation of MPTS and the abolishment of a required minimum NSS to advance past Primary Flight Training. By examining three years worth of historical data, we were able to determine the precise NSS that significantly reduced flight attrites, but did not greatly affect overall production numbers.

III. PROJECT SCOPE

As previously mentioned, the original purpose of this study was to look at the correlation between grades in the three phases of flight training and determine if there should be a minimum NSS to select into certain rotary-wing communities. As the focus of the study changed, the scope narrowed slightly as required.

This study was not designed to determine whether or not a student should attain a minimum NSS to complete primary flight training, or if there should be a minimum NSS to select for E6, or Multi-engine. It was specifically tailored to help select the best students possible into the rotary-wing community while reducing the number of flight attrites without affecting aviator production.

A. PERIOD OF STUDY

The data collected was gathered with the help of The Training Wing Five Planning & Statistics Department for the three-year period of June 2004-May 2007. The beginning of this period was chosen to allow six months for the existing advanced helicopter training squadrons to adjust to MPTS, while the ending date was chosen to coincide with the formation of the third advanced helicopter squadron. Due to the limited time associated with this project, data was not collected from Training Wing Four squadrons VT-31 and VT-35 to compare attrite data, or determine production feasibility of this study’s recommendations and conclusions.

VI. METHODOLOGY

A. DATA COLLECTION

The Planning and Statistics Department of Training Air Wing FIVE provided data on all Navy and Marine Corps students who selected the rotary wing pipeline over the last three years. The resulting data set yielded Primary Training NSS Phase Aggregate Scores (NSSPAS), Advanced Training NSS (NSS) and attrition codes (where applicable) for 1286 NFSs.[1]

The data was then separated into several different groups for analysis. In addition to the initial data set, the data were separated by primary squadron as follows: VT-2, 241 NFSs; VT-3, 126 NFSs; VT-6, 270 NFSs; VT-27, 287 NFSs; VT-28, 254 NFSs; 33FTS, 108 NFSs; by advanced squadron: HT-8, 610 NFSs; HT-18, 646 NFSs; and by non-grad NFSs: 66 total. After removing NFSs who did not complete training, the final data set was 1227 NFSs.

B. DATA ANALYISIS

Data analysis was performed to determine average primary NSSPAS and advanced NSS, standard deviation, average deviation, high, median, and low NSS. The Pearson Product Moment Correlation coefficient was also determined.[2] When analyzing primary and advanced data, non-graduate data

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[1] Seward, Barbara. "3-YR USN_USMC Completors.xls." January 23, 2008.

[2] *HyperStat Online.* http://davidmlane.com/hyperstat/, February 5, 2008.

was used only if the NFS completed all training prior to attrition.

The Pearson product moment correlation coefficient was used to determine a relationship between primary and advanced NSS. The Pearson product moment correlation coefficient (r) is an index that ranges from -1.0 to 1.0. It reflects the extent of a linear relationship between two data sets. For example, a value of -1 would indicate a perfect negative correlation. This would indicate an inverse relationship in the two scores, for example, if you do well in primary, you do poorly in advanced. Conversely, a perfect positive correlation would give a value of 1 indicating, for example, that good performance in primary leads to good, or better, performance in advanced. Values that approach zero indicate less of a correlation between data sets. The statistical significance of r is largely based upon sample size. A data set of 8-10 NFSs (as with the non-graduates) does not yield enough points to establish a valid correlation, whereas the entire group of 1227 NFSs yields so many data points that a correlation can be established.

Finally, the data was analyzed to determine what percentage of wingers saw an increase in NSS between primary and advanced training and what the average change was. This was done as a means to further qualify the data obtained from the correlation coefficient.

V. RESULTS

A. PRIMARY NSS TO ADVANCED NSS CORRELATION

After analyzing the data for all flight students who completed advanced flight training we were able to determine the existence of a significant positive correlation between Primary NSS and Advanced Helicopter NSS. As shown in Table 1, the correlation between Primary and Advanced Helicopter grades was .467. As previously discussed, the large sample size indicates that those who do well in primary do as well, if not better, in advanced rotary-wing training. We can conclude that these results would be due to chance less than one time in one hundred. Furthermore, analysis shows that 67.73 percent of all flight students who completed advanced training earned a higher NSS than they did in primary. Of those who increased their NSS, the average increase was 4.51. Also noted during the analysis was that the average and median NSS for all students entering Helicopter Advanced was 45, with a standard deviation of 7.63 and an average deviation of 6.1.

It should be noted that there is not a perfect correlation between primary and advanced NSSs and some variance is present. The proportion of the variance shared by the two data sets was analyzed by obtaining the square of the correlation coefficient (r^2). The .21 value obtained indicates that 21% of the variance obtained is accounted for by NSSPAS and NSS correlations while 71% of the variance seen is unaccounted for. This means that while there is a high statistical correlation between the two

data sets, we are not able to attribute the majority of the variance between the sets to any causes that fall within the scope of this study.

Primary		Advanced	
NSSPAS Average	45.16	NSS Average	49.67
Standard Deviation	7.63	Standard Deviation	10.1
Average Deviation	6.10	Average Deviation	8.15
Median NSS	45.5	Median NSS	48.9
Highest NSS	80	Highest NSS	80
Lowest NSS	20.8	Lowest NSS	20
Primary to Advanced Correlation Coefficient	.467	Percent of Wingers Increased NSS from Primary to Advanced	67.7
R^2	.21	Average NSS Increase	4.51

Table 1. Three-Year-Winger Data.

B. ATTRITE DATA

The median and average NSS of the flight attrites was, at one time, the minimum NSS required to advance from Primary Flight Training. In the three-year period of the study there were 67 attrites with 38 flight attrites. One

non-flight attrite was removed from the study due to the tragic cause of that student's attrition. A flight attrite is characterized by a NFSs removal from training for deficient performance.

The results of analyzing attrite data, shown in Table 2, provided the information needed to achieve the second and third objectives of this study. The average and median NSS of all flight attrites for the three-year period of this study was 35.42, with a standard deviation of 6.17 and average deviation of 4.96.

Primary	
NSSPAS Average	35.42
Standard Deviation	6.17
Average Deviation	4.96
Median NSS	35
Highest NSS	50.8
Lowest NSS	23.9
Primary to Advanced	
Correlation Coefficient	
	-0.25
R^2	0.065

Table 2. Three-Year-Flight Attrite Data.

1. Manpower Ramifications

Implementing a minimum NSS to select Rotary-wing would have an immediate affect on the production of Naval Aviators by the Advanced Helicopter Training Squadrons. In addition to being effective in lowering the number of flight attrites, a minimum NSS must also not greatly affect the production of Naval Aviators.

Selecting a minimum NSS at the average and median NSS of 35 reduced the flight attrites by 21 students, or 55 percent, and overall attrition by 31 percent. Applying the standard deviation results in a NSS range of 29-42, where approximately 50 percent of the flight attrites occurred. However, when applied separately, a 29 NSS only reduces flight attrites by 7 students, or 18 percent while a 42 NSS reduces flight attrites by 38 students or 89 percent.

If a minimum NSS of 42 had existed during the three-year period examined, it would have resulted in a loss of 432 students, or 33 percent of the students selected for Advanced Helicopter Flight Training. However, if 35 had been the minimum NSS to select rotary-wing during the three-year period, it would have resulted in a loss of 148 students, or 11.4 percent or the students selected for Advanced Helicopter Flight Training.

The selection of either 42, or 35 as the minimum NSS to select Rotary-wing would have decreased flight attrition and resulted in less production by the Advanced Helicopter Squadrons during the three-year period of study. However, selecting 35 as the minimum NSS instead of 42 would have maximized the reduction of flight attrites while minimizing the impact on production.

What the numbers in this study do not show are the causal factors for the flight attrites. In this study's data, flight attritions were only differentiated by the stage of training when the attrition occurred. This does not speak to the abilities of the NFS. Applying a minimum NSS may overlook the root cause of the real problem. For example, excessive breaks in training, subjective grading, student reputation/attitude, or personal and emotional issues could all lead to deficient performance resulting in flight attrition. However, the data obtained for this study cannot account for the presence, or lack, of these factors.

VI. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

Admittedly, this study was not as robust as initially desired. Instead, it serves as the starting point to transform a historically anecdotal argument into an empirical, analytical discussion. The findings and recommendations of this study are by no means absolute. Combined with future research, this study can help improve the quality of training provided to Naval Flight Students and greatly increase the quality of the aviators sent to each community in Naval Aviation.

B. RECOMMENDATIONS

This study supports instituting a minimum NSS of 35 to select rotary-wing. This could reduce the number of flight attrites; however, it may not address the root cause of deficient student performance.

Due to the lack of data, this study recommends the following course of action for CNATRA:

- Conduct a future study to analyze similar data from Training Wing FOUR and determine the validity of setting a minimum NSS for selecting Rotary-wing.

The limited amount of data available for this study was a major hindrance. To better enhance performance feedback from the Fleet Replacement Squadrons to the Advanced Helicopter Squadrons by providing empirical data

vice anecdotal data, this study recommends that all Fleet Replacement Squadrons:

- Establish a database to record individual student performance data in order to historically compare students.

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LIST OF REFERENCES

1. CNATRA Instruction 1500.4G; Student Naval Aviator Training and Administration Manual.

2. Seward, Barbara. “3 Yr USN_USMC Completor.xls.” January 23, 2008.

3. *HyperStat Online.* http://davidmlane.com/hyperstat/, February 5, 2008.

4. *“Correlation.”* http://en.wikipedia.org/wiki/Correlation, February 5, 2008.

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